"VR WEBCAMS", ON MARS, FOR THE PEOPLE OF EARTH. Michael Naimark [naimark@media.mit.edu]
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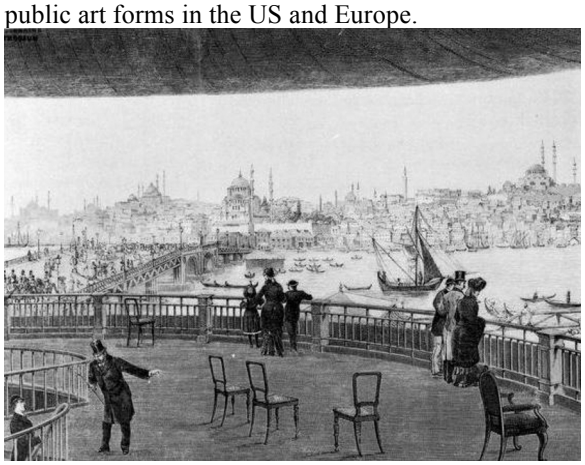
A Simple Proposal: To provide the public with, as a way of "giving back", the most immersive mediated experience possible of Mars - including the journey, being at the landing site, and moving around (perhaps with some interaction, albeit delayed) - in scales ranging from world's fair-sized architectural environments to economical classroom-sized spaces to personal viewers. The optimal approach for success is to "work both ends", by simultaneously co-designing both the capture and display systems. The term "VR webcam" is used here to denote a multi-sensory capture system capable of maximum "virtual reality" immersion, possibly live or partially live.

"Like Being There": The dream of using media to convey a strong, visceral sense of place is ancient, but has particular roots in the panoramas and cycloramas of the late Eighteenth Century, where special buildings housed huge cylindrical paintings. During the Nineteenth Century, these were among the most popular public art forms in the US and Europe.



Nineteenth Century Cyclorama

Multi-projection digital CAVE

Such panoramas were the precursor to "Special Venue" films such as Imax and CircleVision, often produced for world expositions going back to Paris 1900 and the birth of cinema [1]. A newer strain of immersive experience, "virtual reality", is digital, requiring realtime 3D computer models and either multi-screen projection such as CAVEs or individual head-mounted displays (HMDs). In all of these instances, the goal is "like being there," often in an ambient rather than narrative sense.

How Good Can it Be?: Our sensory/effectory apparati are incredibly hard to fool, particularly our eyes. Even in a 3D Imax movie or a well-tuned CAVE or HMD VR experience, we remain congnizant that we're not really "somewhere else". For example, some of the "elements of real-space imaging" [2] include high spatial and temporal resolution; proper accommodation and convergence; proper scaling (orthoscopy) and perspective (unique for each viewer); no time artifacts (such as those produced via panoramic "tiling"); plus non-visual elements such as sound, wind, climate, and smell (all of which have been incorporated over the years in various public space experiments). In short, making realworld representations perfectly indistinguishable from first-hand reality is impossible.

But we've learned some tricks, most always by trial-and-error experience, as these tend to be unpredictable and counterintuitive. World Expos have housed some expensive disasters (washed out projection, transparent floors, scratch-and-sniff), but also some cost-effective successes. For example, proper convergence tends to trump improper accommodation. Fields of view greater than 60 degrees, if orthoscopically correct, vastly increase the sense of immersion. Proper perspective via realtime head tracking is less important when viewers are stationary (e.g. seated). And "hints" or "suggestions" of various sensations such as platform motion, peripheral imagery, spatialized sound, wind, and smell may offer very large "bangs per buck."

What's Mars Like?: If absolutely nothing changes on the Martian landscape, visual immersion can be as simple as making a Nineteenth Century panoramic painting. But we know, at least, that there is day and night (39 minutes longer than Earth days) and seasons (687 Earth day years). Is there wind and other forms of weather? Sound? (Remember Carl Sagan proposed a microphone on Mars in the early 1970s, a project still pending.) [3]. Does the soil or atmosphere smell? Can various movement-based activities, ranging from actual scientific experiments to games such as throwing

and catching a ball, be captured immersively? All of these factors could be considered in making immersive experiences for the public.

Different Scale Experiences: Designing a world's fair immersive theater, a ten-person space suitable for schools and museums, and a personal viewer (either worn like an HMD or held like a ViewMaster) are not only different exercises, they involve different professional communities. The big-scale theater community comes out of cinema. They often work with 70mm film (e.g., Imax, Showscan) or synchronized projection (CircleVision, Hexiplex) and produce fundamentally linear narrative experiences. The smaller-space community (CAVEs) tend to rely on digital projection and 3D models, enabling more control. The personal viewer community is bifurcated between expensive digital HMDs and inexpensive consumer-oriented products (e.g., the film-based ViewMaster and Hasbro's iPhone-based My3D). Additionally, there's a dome community which spans from large-scale planetaria to portable inflatable projection domes. Because of the different venues and markets, scale is rarely addressed as a systemic issue; doing so would itself be a significant contribution to the immersive arts and sciences.

Hasbro My3D immersive viewer

Offshoots: In addition to understanding issues of scale and immersion, one very significant offshoot is earth-based VR webcams and earth-based virtual travel: to sacred and endangered sites, world wonders, disaster areas, inaccessible places such as undersea, and places too big or too small to readily experience. There's currently a great deal of attention around mapping and modeling the world (e.g., Google Earth and Streetview) [4], and it would only seem natural to want to experience the data as richly as possible. Better "VR cameras" in the end will benefit the consumer for placing their own photos in immersive environments [5] and better immersive display environments will benefit non-realworld applications such as gaming.

Google Street View camera/LIDAR configuration

Advisors and Sponsors: The author has been privileged to have worked with very talented individuals across all "VR webcam" venues, and one of the first activities would be to convey a meeting of those interested. They include: Douglas Trumbull (SFX for 2001, Bladerunner, Close Encounters; inventor of Showscan; seasoned special-venue theater producer), Lenny Lipton (Stereographics founder, RealD CTO), Tom Defanti and Dan Sandin (CAVE inventors), David McConville (Eluminati digital domes), Ed Lantz (Vortex portable domes), Carter Emmart (Hayden Planetarium), Jaron Lanier and Kevin Kelly (coiners of "virtual reality"), Henry Fuchs (UNC tele-immersion), and my VR colleagues at USC (former NASA researcher Scott Fisher, Mark Bolas, Marientina Gotsis, and Perry Hoberman) and at MIT (Andrew Lippman, P.I. for the Aspen Moviemap, and Marvin Minsky, who first coined the term "telepresence").

In addition to potential interest from MIT and USC, corporations working on Earth mapping and modeling such as Google may have an interest in sponsorship.

References:

[1] Naimark M. (1992) "Expo '92 Seville," *Presence*, vol. 1, no. 3.

[2] Naimark M. (1991) "Elements of Realspace Imaging: a Proposed Taxonomy," *SPIE* vol. 1457.

[3] http://sprg.ssl.berkeley.edu/marsmic/ (5/10/12)

[4] http://www.media.mit.edu/events/2011/05/02/michael-naimark-place-representation-and-one-earth-model (5/10/12)

[5] http://interactive.usc.edu/projects/viewfinder/ (5/10/12)

For more information:

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